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10/748,829	12/29/2003	Weidong Yang	NAN066 US	7169

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EXAMINER
ROSARIO, DENNIS

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2007*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-36* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date *10/24/07*.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

Response to Amendment

1.   The amendment was received on 10/24/07. Claims 23-36 are pending.

Response to Arguments

2.   Applicant's arguments on page 7, lines 15-19 filed 10/24/07 have been fully

considered but they are not persuasive and states:

"...these references [Nikoonahad, Raymond and Stirton] disclose

correcting for misalignment using a processing tool based on the measured

overlay error, not 'correcting the determined overlay error for effects of local

process variations'..."

a)   The examiner respectfully disagrees since Nikoonahad discloses

correcting (corresponding to "correct any errors" in col. 15, line 58) the determined

overlay error (corresponding to "Overlay errors...are then measured" in col. 15, lines 53-

55 then corrected since Nikoonahad can correct any errors such as overlay errors) for

effects (that cause "pitches of the...gratings [to] be different in the two-dimensional

image" in col. 11, lines 61-65) of local process variations (corresponding to different

elevations as represented in fig. 9);

b) Raymond discloses correcting (via figures 16 and 17 that show more information about offset-50 nm relative to fig. 15 that cannot distinguish an offset of +50nm from -50 as shown by the plots in fig. 15) the determined overlay error (in fig. 15 as offset-50nm) for effects of local process variations (corresponding to "thickness of the grating" in col. 6, line 54 as shown in the top grating of fig. 16 for an offset=50 nm that shows different grating thicknesses for the top grating); and

c) Stirton discloses correcting the determined overlay error (corresponding to a "reduction in the overlay error" in col. 11, line 13) for effects of local process variations (corresponding to "different semiconductor manufacturing process conditions" in col. 11, lines 3,4.)

3.   Applicant's arguments on page 8, lines 1-3 have been fully considered but they

are not persuasive and states:

        "...Mieher...does not disclose...'correcting <u>the determined overlay error</u> for

effects of local process variations'..."

        The examiner respectfully disagrees since Mieher discloses correcting (via

"separate[ing]" in paragraph [0133], line 6 to "improve the measurement precision" in

[0133], last sentence) the determined overlay error (or "overlay" in [0133], line 7) for

effects ("effects" in [0133], line 6) of local process variations (where said effects

correspond to "film effects" in [0133] 7 which corresponds to "film thickness variation" in

[0006], line 8 that contribute to the overlay measurement, and thus has to be separated

from the determined overlay error with film effects).

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5.   Claims 23, 24 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated

by Nikoonahad et al. (US Patent 7,009,704 B1).

Regarding claim 23, Nikoonahad discloses a method comprising:

a)   providing an overlay pattern (fig. 9) having a plurality of measurement

locations, each measurement location includes a bottom diffraction grating (fig. 9,num.

132) and a top diffracting grating (fig. 9,num. 136) that overlies the bottom diffraction

grating and has a designed in offset (or "different pitch" in col. 11, line 67) from the

bottom diffraction grating;

b)   illuminating (fig. 1: Illumination) each of the plurality of measurement

locations of the overlay pattern with incident radiation that reacts with the diffraction

gratings;

c)   detecting (fig. 1,num. 32) the radiation from the measurement locations

after reacting with the diffraction gratings;

d)   determining an overlay error (via fig. 8,num. 18) between the bottom

diffraction gratings and the top diffraction gratings using the detected radiation from the

measurement locations from the overlay pattern; and

e)   correcting the determined overlay error (or "correct any errors" in col. 16,

line 3 or see paragraph 2a), above) for effects of local process variations created during

processing of the overlay pattern using the detected radiation from at least one pair of

the measurement locations from the overlay pattern.

Regarding claim 33, claim 33 is rejected the same as claim 23 except for the additional limitation as discloses in Nikoonahad of a method comprising:

a)　providing an overlay patten (fig. 6A,num. 34) having at least four measurement locations (one of which is indicted by an arrow pointing to 34 that can points to other areas of 34), each measurement location having a bottom diffraction grating (fig. 6A,num. 24(1)) and a top diffracting grating (fig. 6(A), num. 24(2)) that overlies the bottom diffraction grating and has a designed in offset (as shown in fig. 6A) from the bottom diffraction grating, at least two pairs of the measurement locations have the same magnitude designed in offset (or "same settings for pitch" in col. 11, line 65).

Regarding claim 24, claim 24 is rejected the same as claim 23 except for the additional limitation as disclosed in Nikoonahad of further comprising:

a)　providing the overlay pattern (or "wafer: in col. 15, line61) having the plurality of measurement locations prior (during a "remov[al] in col. 15, line 63 process) to depositing the top diffraction gratings (or "photoresist" in col. 15, line 60) over the bottom diffraction gratings, such that the overlay pattern is incomplete and each measurement location of the incomplete overlay pattern has a bottom diffraction grating.

6.   Claims 33 and 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Raymond (US Patent 6,856,408 B2).

Regarding claim 33, Raymond discloses of a method comprising:

a)   providing an overlay pattern (fig. 1: Film layers) having at least four measurement locations (one of which is indicted by an arrow pointing to Film layers that can points to other areas of Film layers), each measurement location having a bottom diffraction grating (or bottom portion of Film layers) and a top diffraction grating (fig. 1: Patterned (periodic) features) that overlies the bottom diffraction grating and has a designed in offset (fig. 14:offset) from the bottom diffraction grating, at least two pairs (as shown on the right side of fig. 15) of the measurement locations have the same magnitude (fig. 15: offset=-50nm and offset=50nm) designed in offset;

b)   illuminating (fig. 1:Input laser beam) each of the measurement locations of the overlay pattern with incident radiation that reacts with the diffraction gratings;

c)   detecting (fig. 1:Detector) the radiation from the measurement locations after reacting with the diffraction gratings;

d)   determining an overlay error (or "overlay misalignment" in col. 5, line 7) between the bottom diffraction gratings and the top diffraction gratings using the detected radiation from the measurement locations; and

e)   correcting (via an "alignment" in col. 11, line 21) the <u>determined</u> overlay

error (corresponding to a "measurement resolution" in col. 11, line 30 <u>or see paragraph</u>

<u>2b, above</u>) for effects of local process variations created during processing of the

overlay pattern using the detected radiation from at least one pair of the measurement

locations from the overlay pattern.

Regarding claim 34, Raymond discloses the method of Claim 33, wherein at

least two of the measurement locations have the same magnitude designed in offset in

opposite directions (as discussed above with respect to fig. 15: offset) and at least two

measurement locations have the same magnitude designed in offset in the same

direction (as indicated in fig. 15: Angle Number that indicates a single angle for both

measurement locations).

7.   Claims 23-33,35 and 36 are rejected under 35 U.S.C. 102(e) as being anticipated

by Mieher et al. (US Patent Application Publication No.: 2004/0169861 A1).

Regarding claim 33, Mieher discloses of a method comprising:

a)   providing an overlay pattern (fig. 2(a)-(f)) having at least four

measurement locations (as indicated in fig. 3(a), numerals 302(a)-302(d)),

each measurement location having a bottom diffraction grating and a top diffraction

grating that overlies the bottom diffraction grating and has a designed in offset from the

bottom diffraction grating (all of which is shown in figs. 2(a)-2(f)), at least two pairs of the

measurement locations have the same magnitude designed in offset (fig. 2(a) has offset

+F and fig. 2(b) has offset –F);

b)   illuminating (via fig. 4,num. 402) each of the measurement locations of the

overlay pattern with incident radiation that reacts with the diffraction gratings;

c)   detecting (fig. 4,num. 412) the radiation from the measurement locations

after reacting with the diffraction gratings;

d)   determining an overlay error (fig. 3(a), num. 308) between the bottom

diffraction gratings and the top diffraction gratings using the detected radiation from the

measurement locations; and

e)   correcting the determined overlay error (or "corrections...of the errors" in

paragraph [0070], last sentence or see paragraph 3, above) for effects of local process

variations created during processing of the overlay pattern using the detected radiation

from at least one pair of the measurement locations from the overlay pattern.

Regarding claim 35, Mieher discloses the method of Claim 33, wherein a first pair

(fig. 3(a), numerals 302a and 302b) of the measurement locations have a first

magnitude designed in offset (+F+f0 in num. 302a and −F+f0 in num. 302b) in opposite

directions and a second pair (fig. 3(a), numerals 302c and 302d) of the measurement

locations have a second magnitude designed in offset in opposite directions (+F-f0 in

num. 302c and −F-f0), wherein the first magnitude (said +F+f0) is different (via +/-sign)

than the second magnitude (+F-f0).

Regarding claim 36, Mieher discloses the method of Claim 33, wherein correcting

the _determined_ overlay error for effects of local process variations created during

processing of the overlay pattern is performed while determining the overlay error (since

the correcting of Mieher is done to during the step of "refine the determination of the

overlay E" in [0070], last sentence).

Claim 23 is rejected the same as claim 33. Thus, argument similar to that

presented above for claim 33 is equally applicable to claim 23.

Regarding claim 24, claim 24 is rejected the same as claim 23 except for the

additional limitation as disclosed in Mieher of further comprising:

a)   providing the overlay pattern having the plurality of measurement locations

prior to depositing the top diffraction gratings over the bottom diffraction gratings (or

"partial...layer" in [0065]), such that the overlay pattern is incomplete and each

measurement location of the incomplete overlay pattern has a bottom diffraction grating.

Regarding claim 25, Mieher discloses the method of Claim 24, wherein using the detected radiation from the measurement locations of the incomplete overlay pattern and the detected radiation from the measurement locations of the completed overlay pattern to determine the overlay error comprises:

a)   generating a plurality of ratios (as shown in [0064]) of differential spectra from measurement locations of the incomplete overlay pattern;

b)   generating a plurality of differential spectra (as shown in [0064]) from measurement locations of the completed overlay pattern;

c)   using said plurality of ratios and said plurality of differential spectra to determine the overlay error ("determine overlay" in [0065]).

Regarding claim 26, Mieher discloses the method of Claim 25 wherein using said plurality of ratios and said plurality of differential spectra comprises:

a)   directly solving for the overlay error (via said equation in [0064]) based on said plurality of ratios and said plurality of differential spectra.

Regarding claim 27, Mieher discloses the method of Claim 25, wherein using said plurality of ratios and said plurality of differential spectra comprises:

a)   curve fitting (fig. 3(b): Linear approximation).

Claim 28 is rejected the same as claim 36. Thus, argument similar to that presented above for claim 36 is equally applicable to claim 28.

Claim 29 is rejected the same as claim 33. Thus, argument similar to that presented above for claim 33 is equally applicable to claim 29.

Claims 30 and 32 are rejected the same as claim 35. Thus, argument similar to that presented above for claim 35 is equally applicable to claims 30 and 32.

Claim 31 is rejected the same as claim 30. Thus, argument similar to that presented above for claim 30 is equally applicable to claim 31.

8.   Claims 23 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by

Stirton (US Patent 6,458,605 B1)

Regarding claim 23, Stirton discloses a method comprising:

a)   providing an overlay pattern (fig. 3B, num. 200) having a plurality of

measurement locations, each measurement location includes a bottom diffraction

grating (fig. 3A,num. 202) and a top diffracting grating (fig. 3A,num. 204) that overlies

the bottom diffraction grating and has a designed in offset (as indicated by the stager of

numerals 212 and 210) from the bottom diffraction grating;

b)   illuminating (fig. 3B, num. 132) each of the plurality of measurement

locations of the overlay pattern with incident radiation that reacts with the diffraction

gratings;

c)   detecting (fig. 3B,num. 134) the radiation from the measurement locations

after reacting with the diffraction gratings;

d)   determining <u>an</u> overlay error (via fig. 3B,num. 136) between the bottom

diffraction gratings and the top diffraction gratings using the detected radiation from the

measurement locations from the overlay pattern; and

e)   correcting the <u>determined</u> overlay error (via an "error correction" in col. 4,

line 3 <u>or see paragraph 2c), above</u>) for effects of local process variations created during

processing of the overlay pattern using the detected radiation from at least one pair of

the measurement locations from the overlay pattern.

Regarding claim 24, claim 24 is rejected the same as claim 23 except for the additional limitation as disclosed in Stirton of further comprising:

a)   providing the overlay pattern (as indicated in fig. 3A) having the plurality of measurement locations prior to depositing the top diffraction gratings over the bottom diffraction gratings, such that the overlay pattern is incomplete and each measurement location of the incomplete overlay pattern has a bottom diffraction grating.

Conclusion

9.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Adel et al. (US Patent 6,921,916 B2) is pertinent as teaching a method of overlay that can "diminish the impact of…pro-cess non-uniformities, asymmetries and variations" in col. 7, lines 51,52.

10.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Dennis Rosario whose telephone number is (571) 272-

7397. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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